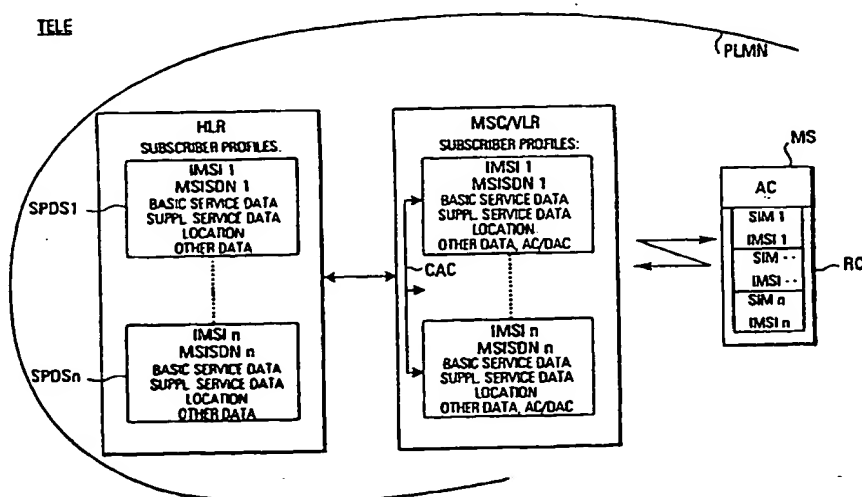




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(54) Title: MOBILE STATION, MOBILE RADIO COMMUNICATION NETWORK AND COMMUNICATION METHOD USING SEVERAL SUBSCRIBER PROFILES



## (57) Abstract

A mobile station (MS) has a receiving means (H) for receiving two or more subscriber identity modules (SIM1-SIMn) each having stored in a home location register (HLR) of a network (PLMN) a corresponding subscriber profile data set (SPDS1...SPDSn). The mobile station (MS) comprises an activation/deactivation means (AC) for selectively activating/deactivating one or more of said subscriber identity modules (SIM1-SIMn) inserted in the mobile station (MS). The subscriber can use selectively and simultaneously services from several subscriber profile data sets (SPDS1...SPDSn) which belong to the same subscriber and which have been stored in a home location register (HLR) and in the mobile switching center/visitor location register (MSC/VLR) handling the communication in a cell where the mobile station (MS) is located. When several subscriber identity modules (SIM1-SIMn) belong to different users, the mobile station (MS) can thus be used commonly by several users.

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MOBILE STATION, MOBILE RADIO COMMUNICATION NETWORK AND  
COMMUNICATION METHOD USING SEVERAL SUBSCRIBER PROFILES

10

Background of the Invention

15 The invention relates to a mobile station, a mobile radio  
communication network and a communication method for  
performing communications using several subscriber  
profiles. In particular, the invention relates to mobile  
radio communication networks in which the end terminals  
20 (mobile stations) are controlled by so-called subscriber  
identity modules (SIMs).

Fig. 7 shows a telecommunication system TELE comprising at  
least one public land mobile radio communication network  
25 PLMN in which a number of mobile stations MS1-MS4 perform  
communications by means of an exchange EX comprising at  
least a home location register HLR and a mobile switching  
center/visitor location register MSC/VLR. As is illustrated  
with the mobile station MS4, in such a network PLMN the  
30 subscriber (user) can use any mobile telephone (and  
terminal) by inserting a specific plug-in unit PIU1-PIU4  
into the mobile station MS4. The plug-in unit is a  
conventionally known SIM-card. The SIM-card, which the  
subscriber has bought from the provider, contains a  
35 subscriber identity which is allocated to a directory  
number. If the network PLMN is of a GSM-type, then the  
subscriber's identity is the IMSI and the directory number  
is the MSISDN.

40 When the subscriber acquires the SIM-card from the  
provider, he/she buys a number of subscribed services

5 (basic and supplementary services) and the subscribed services, the IMSI, the MSISDN and other information relating to the subscriber is stored permanently as a data record in the home location register HLR by the provider of the network. The subscriber (user) may obtain several  
10 different SIM-cards from the provider, for example to have subscriptions for different types of services, and therefore the home location register HLR can have a number of subscriber profiles each identified by the combination of IMSI and MSISDN.

15 When a particular SIM-card has been inserted into the mobile station MS4 and the mobile station roams into different local areas of the network PLMN, then a copy of the subscriber data (a subscriber profile) relating to the  
20 inserted SIM-card is copied to the mobile switching center/visitor location register MSC/VLR, wherein the visitor location register VLR contains data as to where the mobile station MS4 is currently located.

25 Fig. 1 only shows those parts of a conventional PLMN network, which are necessary to understand the background of the invention. However, of course the PLMN network comprises all functionalities normally used in a mobile radio communication network, such as a base station system  
30 BSS, base station controllers BSC and numerous mobile switching centers MSC serving different service areas (e.g. cells of the network) of the PLMN network. Signaling which is necessary to perform such communications between the mobile stations MS1-MS4 is for example described in the  
35 ETSI Recommendations for the European GSM network.

#### Description of the Prior Art

For PLMN networks of the GSM-type a particular service  
40 using multiple subscriber profiles MSPs enabling the mobile stations to have several subscriber profiles has already

3

5 been partially standardized by ETSI (reference [1]: Digital Cellular Communication System (Phase 2+); Multiple Subscriber Profile (MSP) Service Description, Stage 1 (GSM 02.97), Version 5.0.0, July 1996; Reference [2]: Digital Cellular Telecommunications System (Phase 2+); Multiple  
10 Subscriber Profile (MSP) - Stage 2 (GSM 03.97), Version 0.2.0, October 1996; Reference [3]: GSM 09.02, Version 5.0.0, May 1997, pages 293-326). However, no signalling procedures for MSP but only general GSM procedures are described in these documents.

15

According to this prior art, the multiple subscriber profile service is an optional service to enable mobile subscribers to have several profiles associated with a single SIM and a single IMSI, wherein each profile is a  
20 subscription option. Each profile may be used for mobile originated and mobile terminated calls. A subscriber profile consists of a set of basic services for the subscriber. In the case of the single numbering scheme there is a unique MSISDN associated with each profile. In  
25 the multi-numbering scheme there is the ability to have a unique MSISDN associated with each basic service in each profile. The profile (subscriber) data is a set of subscriber data (identified by a unique MSISDN in the case of the single numbering scheme or several MSISDNs in the  
30 case of the multi-numbering scheme) and may include operator determined barring data, roaming restriction data, subscription restriction data, basic service data and supplementary service data. A selected profile is the currently registered profile unless an alternative profile  
35 selected by the subscriber on a per call basis and used for outgoing calls and supplementary service activation. There is also defined a default profile, which is the profile to be used when the subscriber is roaming to non-supporting networks.

40

5 As shown with the mobile station MS1 in Fig. 7, the ETSI  
standards using the MSP feature currently recommend up to  
four different profiles P1-P4 on one MSP-SIM card, i.e. the  
MSP-SIM card is a card with up to four profiles belonging  
logically to one provider. This will allow the subscriber  
10 to separate his telecommunication service needs into  
different categories (e.g. business and home). The charges  
incurred for the services will then be associated with the  
appropriate profile which allows a separate charging for  
each profile.

15 Fig. 7 also shows another possibility not using the MSP  
feature where into the mobile station MS4 one of four  
different cards each having a specific profile stored  
thereon is inserted.

20 The aforementioned references [1], [2], [3] of the prior  
art describe the functional requirements for the handling  
of the MSP service in a GSM network. Typical functional  
requirements are for example the "attach procedure" when a  
25 mobile station is switched on and tries to connect to the  
mobile switching center/visitor location register MSC/VLR  
of the network PLMN requiring the provision of a particular  
set of subscriber data of a particular selected subscriber  
profile, the "detach procedure" when the mobile station  
30 desires to disconnect from the network PLMN, the "location  
updating and location cancellation procedure" for updating  
location data of the mobile station when it moves to an  
area served by another VLR and the "subscriber data  
updating procedure" for changing data in subscriber  
35 profiles already set up in the home location register HLR.

The above procedures have been subjected to extensive  
standardization as may be taken from the references [1]-[3]  
and no further description will be made here.

5 Problem of the prior art

As already mentioned above, one possibility is (e.g. in fig. 7 for MS4) that a first SIM-card PIU1 may relate to a "business subscriber profile" which will be used when this  
10 SIM-card PIU1 is inserted in the mobile station MS4. Alternatively, for example the SIM-card PIU2 may be related to a special "private subscriber profile" which will be used when the SIM-card PIU2 is inserted in the mobile station MS4. A separate charging for each profile is  
15 enabled, however, the distribution of the costs for example for business and private calls can cause problems and involve extra work. For example, one user may want to use one subscriber profile during the day for business calls and during the evening for private calls. However, once the  
20 SIM-card has been inserted, there is no possibility of further distinguishing or distributing costs charged for this SIM-card for different types of use or for different users.

25 Furthermore, the requirements of one user regarding the needed telecommunication services may also be different for the private and business use. However, again once the SIM-card has been inserted, the user is fixed to the selected subscriber profile which has been allocated for the  
30 inserted SIM-card in the home location register HLR.

Furthermore, for example in a company, several users may use the same company SIM-card at different times and there is no possibility to distribute the costs among the several  
35 users, since there is only one account (or counter) within the mobile switching center/visitor location register MSC/VLR counting the incurred charges for the single card. Therefore, unless the single user notes separately when business calls or private calls were made on the same card  
40 or unless different users note when they have used the SIM-card, there is no further possibility to specifically

5 distribute the costs and/or to select for example different  
services for a private call and a business call as soon as  
the single card has been inserted into the mobile station.  
On the other hand, there is also an existing solution  
called "discount codes" where the user gives with each call  
10 some additional information (e.g. by pressing the addition  
key) to indicate e.g. the account for that call.

The solution to the above problem which is currently  
standardized for the GSM MSP supplementary service by ETSI  
15 is to provide several subscriber profiles under one single  
IMSI (i.e. the afore mentioned MSP service). As the  
reference [1] describes, using the conventional MSP service  
in the GSM network, the subscriber can separate his  
telecommunication service needs into different entities  
20 like business calls and also private calls. That is,  
instead of buying two cards each associated with a  
particular subscriber profile, the user obtains a single  
card having a single subscriber identity IMSI and one or  
more directory numbers MSISDNs allocated to it. Under this  
25 single IMSI multiple subscriber profiles are available to  
the user. However, this solution is very cumbersome since  
it requires a restructuring of the subscriber profile  
structure in the visitor location register VLR and the home  
location register HLR. Furthermore, additional fields for  
30 billing related services (Advice of Charge) on the SIM-card  
are necessary. Whilst the user may thus select a particular  
subscriber profile under one subscriber's identity IMSI,  
all subscriber profiles must be associated with one service  
provider (since only one IMSI is used). Furthermore, the  
35 single IMSI solution does not give the user any flexibility  
and control over the profiles in terms of which profiles  
are possibly simultaneously active and which profile shall  
be accessible in a network not supporting the MSP service.  
Further disadvantages of the MSP service with respect to  
40 implementing this service in an existing network is that

- 5 the HLR has to be changed and that the individual SIMs have to be changed for all users.

Similar functionalities already exist in systems like the Dual Numbering/Alternate Line Service which aims to provide  
10 a business and a private line. However, such a system does not offer completely separate subscriber profiles, but only an additional line (a new number MSISDN, under which the user is reachable) for the telephony service. Other basic services (like Fax, Data, SMS) and supplementary services  
15 are not available, but are shared between the two lines.

### Summary of the Invention

Thus, the problem of the invention is

- 20 - to provide a mobile station, a mobile radio communication network and a communication method using several subscriber profiles, which provide each user with a flexible control over several subscriber  
25 profiles to which each user has a subscription.

### Solution of the Object

This object is solved by a mobile station according to  
30 claim 1. Furthermore, this object is solved by a method according to claim 11. Furthermore, this object is solved by an exchange according to claim 30. The object is also solved by a telecommunication system according to claim 37. An advantage of the invention is in particular that a  
35 single mobile station loaded with several cards belonging to different users can be shared among the different users.

According to a first aspect of the invention (claims 1, 11) the mobile station has a receiving means for receiving  
40 two or more subscriber identity modules for which a home location register of the network has respectively stored a

5 corresponding subscriber profile data set. The mobile station comprises an activation/deactivation means for selectively activating/deactivating one or more of said subscriber identity modules for a communication in the network. That is, according to this aspect of the invention  
10 several SIM-cards or one SIM-card including a plurality of subscriber identity modules are received in the mobile station and can be activated simultaneously. The user can thus actively use different subscriber profile data sets stored in the home location register selectively or  
15 simultaneously. This allows greater flexibility and the user can use different subscriber identity modules separately which allows a flexible charging of the calls respectively made with the respective subscriber identity module.

20

According to a second aspect (claims 30, 37) of the invention a mobile radio communication network comprises at least one home location register storing a plurality of subscriber profile data sets for each subscriber of a  
25 mobile radio communication network. When the mobile switching center of the mobile radio communication network receives a registration message from a mobile station, the plurality of subscriber profile data sets stored permanently in the home location register for each  
30 subscriber are copied to the visitor location register such that the visitor location register where a mobile station is currently located contains simultaneously several subscriber profile data sets for each user. Since the visitor location register comprises the plurality of  
35 subscriber profile data sets, the user can after activating a specific subscriber identity module in the mobile station use selectively one or more of the subscriber profile data sets stored in the visitor location register.

40 According to a third aspect (claims 2, 3) of the invention the subscriber identity modules are provided on a single

5 SIM-card and the receiving means comprises a single SIM-card slot for receiving the single SIM-card. Alternatively, the subscriber identity modules may be provided on separate SIM-cards and the receiving means comprises several SIM-card slots for receiving the separate SIM-cards. Whilst the  
10 former alternative allows an easy replacement of several subscriber identity modules, the latter alternative allows the replacement of a specific subscriber identity module while keeping the other subscriber identity modules in the mobile station.

15 According to a fourth aspect (claim 4) of the invention the mobile station is provided with a display means which indicates to the user which of the received subscriber identity modules are active. Preferably, the display means  
20 can also indicate which of the activated subscriber identity module have been successfully registered in the network (i.e. in the visitor location register). Further preferably, the display means can indicate the available basic services and the supplementary services for each  
25 subscriber identity module and/or default subscriber identity module and/or the complete data of the respective subscriber profile data set stored in the visitor location register. Therefore, advantageously the user can always be informed of the present state and operation possibilities  
30 for performing calls from the mobile station.

According to a fifth aspect (claims 5, 6) of the invention the activation/deactivation means of the mobile station selects a specific subscriber identity module for  
35 activation in accordance with the specific characteristics of a desired call. For example, when one subscriber identity module is to be provided specifically for private calls, then the user can press a "private" button on the mobile station which selects the specific subscriber  
40 identity module provided for such private calls. Preferably a default setting means is provided for setting one of the

- 5 subscriber identity modules as a default module. This can be done by a user or automatically by the mobile station, for example by always regarding the SIM-card in a specific slot as a default module.
- 10 According to a sixth aspect (claims 7, 14, 31) of the invention a subscriber identity module addressing parameter is sent from an exchange of a telecommunication system to a mobile station when a mobile terminating call is pending at the exchange. The subscriber identity module address
- 15 parameter indicates that a call directed to the IMSI currently used in a particular mobile station uses one (or more) specific subscriber profile data set corresponding to a specific subscriber identity module in the mobile station. In turn, the mobile station comprises a selection
- 20 means for selecting the specific (or several specific) subscriber identity module as indicated in the subscriber identity module addressing parameter. Since the subscriber identity module addressing parameter indicates a specific subscriber profile data set already registered in the
- 25 present visitor location register, the user of the mobile station does not have to manually select the subscriber identity module corresponding to the used subscriber profile data set.
- 30 According to a seventh aspect (claims 8, 9, 12, 13, 15, 16, 17) of the invention the activation/deactivation means sends a registration message to the switching means of the network, wherein the registration message includes a list
- 35 of identifies identifying the subscriber identity modules in the mobile station which have been activated. The registration message requests from the switching means the storage of subscriber profile data sets corresponding to the activated subscriber identity modules from at least one home location register in the switching means. Thus, the
- 40 respective visitor location register of the switching means where the mobile station is currently located contains the

5 subscriber profile data sets of all activated subscriber  
identity modules. Preferably, in a GSM-network such a  
registration message is a Location\_Update\_Request Message  
containing a List of IMSIs identifying the activated  
subscriber identity modules to a mobile switching  
10 center/visitor location register of the mobile radio  
communication network. The mobile switching center/visitor  
location register forwards this registration message to one  
or more home location registers which then return an  
Insert\_Subscriber Data\_Request Message containing the  
15 requested subscriber profile data sets corresponding to the  
IMSIs to the respective visitor location register. The  
sending of a registration message and the corresponding  
copy procedure to copy a subscriber profile data set from a  
home location register to a respective visitor location  
20 register is repeated whenever a subscriber identity module  
is activated in the mobile station. When the registration  
has been finalized, indication parameters indicating to the  
mobile station the subscriber identity modules which have  
been successfully registered by the network can be provided  
25 to the mobile station. Preferably the display means can  
then indicate which of the activated subscriber identity  
modules have been successfully registered in the network.

According to an eighth aspect (claims 10, 18) of the  
30 invention the IMSIs used for identifying the mobile station  
identity associated with the subscriber identity module are  
temporary allocated IMSIs. Thus, the safety can be  
improved.

35 According to a ninth aspect (claims 19, 20) of the  
invention the mobile station sends a detach message to the  
switching means, wherein the detach message includes an  
identifier which identifies the deactivated subscriber  
identity module in the mobile station. The switching means  
40 of the network can preferably send a single detach request  
message for each identifier (subscriber identity module) to

5 a respective home location register or a multiple detach request message containing all identifiers of all deactivated subscriber identity modules.

According to a 10th aspect (claims 20, 21, 33, 34) of the invention each subscriber profile data set stored in a home location register or a respective visitor location register comprises an identifier indicating that a subscriber profile data set belongs to a specific subscriber, a directory number parameter, basic service data, supplementary service data, location data and a busy parameter indicating whether a specific subscriber identity module in the mobile station is activated. The subscriber profile data set may also comprise in addition to the busy parameter a so called active/inactive parameter indicating that a user has registered a particular IMSI. Advantageously, the busy parameter can be used in order to determine whether a communication has already been set up between the switching means and the mobile station, such that a separate communication channel does not have to be set up when an additional subscriber profile data set/subscriber identity module is used for a communication. Therefore, a paging message during a connection establishment procedure for a mobile terminating call is only sent to the mobile station when all busy parameters in the respective subscriber profile data sets have a non-busy status.

According to an 11th aspect (claim 23) of the invention the registration message from the mobile station may not only contain an identifier for a newly activated subscriber identity module, but also the identifiers for all subscriber identity modules which have previously been activated and registered in the network. This advantageously enables the switching means of the network to establish or update the cross-links between the individual subscriber profile data sets in the visitor

5 location register and/or the home location register. In a case where the registration message contains only one identifier, the switching means (i.e. the mobile switching center of the network) can keep a record of all identifiers of previously activated and registered subscriber identity modules in a memory and can generate the full list of all  
10 identifiers from the previously stored identifiers and the new identifier contained in the registration message.

According to a 12th aspect (claims 24, 35) of the invention  
15 the subscriber profile data sets stored in the visitor location register for activated subscriber identity modules of the same subscriber may be linked through common links (link channels). Thus, subscriber profile data of one subscriber profile data set can be used commonly by calls  
20 using one or more other subscriber profile data sets. In this case the aforementioned subscriber identity module addressing parameter should indicate that a call uses also subscriber profile data from a different data set, such that the mobile station will immediately "tune" in or  
25 switch-on the respective subscriber identity modules in the mobile station, for example after prompting the user whether he/she allows a reception on his/her other IMSI.

According to a 13th aspect (claims 25, 26) of the  
30 invention, when the mobile stations roams from one servicing area to another servicing area, the mobile switching center/visitor location register responsible for the first servicing area may send a location updating request message to one or more home location registers in  
35 order to request the copying of respective subscriber profile data sets into a mobile switching center/visitor location register responsible for these other servicing area. This location updating request may be sent repeatedly for all activated subscriber identity modules or as a  
40 common locating updating request including all identifiers of all activated subscriber profile modules.

5

According to a 14th aspect (claims 28, 29) of the invention, when the mobile station roams to another network, which does not allow several subscriber profiles (i.e. subscriber identity modules) to be activated and registered simultaneously, the switching means of the another network sends a location updating reponse message indicating that the location updating can only be performed for one subscriber identity module. The switching means of the other network then performs a location updating procedure either for a default subscriber identity module or in response to a specific default selection made by the user. Thus, the transition from a network allowing a registration and activation of several subscriber profiles (i.e. subscriber identity modules) to a network not allowing this is possible. Two cases can be distinguished when the mobile station roams to another network. When several subscriber identity modules are active and the new network can only support one subscriber identity module then the new network can perform the updating only for the subscriber identity module which the new network has itself defined as a default. Alternatively, if the new network only supports one subscriber identity module, the user himself/herself may also set a default subscriber identity module which is to be used by the new network.

30

Hereinafter, the invention will be described with reference to its preferred embodiments and with reference to the attached drawings. In the drawings the same or similar reference numerals designated the same or similar parts or steps throughout.

35

#### Brief Description of the Drawings

In the drawings:

40

15

- 5 Fig. 1 shows a mobile radio communication network PLMN comprising a home location register HLR and a mobile switching center/visitor location register MSC/VLR and a mobile station MS as part of a general telecommunication system TELE according to the invention;
- 10
- Fig. 2 shows a mobile station including a housing to receive a multiple SIM-card comprising a plurality of subscriber identity modules SIM1-SIMn according to the invention;
- 15
- Fig. 3 shows a mobile station including a housing for receiving a plurality of subscriber identity modules SIM1-SIMn separately according to the invention;
- 20
- Fig. 4 shows simultaneously the location updating and attach procedures for several IMSIs according to the invention;
- 25
- Fig. 5 shows a simultaneous detach for several IMSIs according to the invention;
- Fig. 6 shows an updating of a subscriber profile data set for several IMSIs according to the invention;
- 30 and
- Fig. 7 shows an overview of a telecommunication system TELE using a multiple subscriber profile service according to a conventional GSM standard.
- 35

### Principle of the Invention

Fig. 1 shows an overview of a telecommunication system TELE of a mobile radio communication network PLMN according to the invention. As already explained with reference to Fig. 40 7 of the prior art, the conventional means for carrying out

5 the communications between several mobile stations MS like the base station system BSS and the base station controllers BSC are not illustrated in Fig. 1 since they do not form a part of the invention.

10 The network PLMN generally comprises a switching means which is responsible for switching calls between mobile stations MS within a cell. The network also comprises a home location register HLR and as switching means a mobile switching center/visitor location register MSC/VLR.

15 Although not illustrated in Fig. 1 and in Fig. 7, it should also be noted that the invention is not restricted to the usage of only one mobile radio communication network PLMN, i.e. the telecommunication system TELE can also comprise several mobile radio communication networks PLMN or a

20 public switched telephone network PSTN in combination with one or more mobile radio communication networks PLMN. That is, the telecommunication systems TELE may comprise several home location registers HLRs and of course each mobile radio communication networks PLMN comprises one or more

25 visitor location registers VLR and mobile switching centers/visitor location registers MSC/VLR depending on the number of service areas (e.g. cells of the network) serviced by the mobile radio communication network PLMN.

30 A mobile station MS performs communications in such a telecommunication system TELE which may include at least one mobile radio communication network PLMN. The invention is to replace the multiple subscriber profiles MSP as generally discussed in Fig. 7.

35

#### Embodiment of the mobile terminal equipment

As indicated in Fig. 1, the mobile station MS according to the invention comprises a receiving means RC for receiving

40 two or more subscriber identity modules SIM1-SIMn each having stored in a home location register of the at least

5 one network PLMN a corresponding subscriber profile data set (to be described in more detail below) SPDS1...SPDSn simultaneously. Furthermore, the mobile station MS comprises an activation/deactivation means AC for selectively activating/deactivating one or more of said  
10 subscriber identity modules for a communication in the network. That is, a subscriber can use several subscriber identity modules SIMs in a single terminal (mobile station). This is done to allow the subscriber (user) to access a respective subscriber profile data set  
15 SPDS1...SPDSn in the home location register HLR (or respectively in the MSC/VLR) corresponding to each subscriber identity module SIM through a single terminal or mobile station. The activation/deactivation means AC allows the user to selectively activate subscriber identity  
20 modules SIMs which he/she intends to use for a communication, preferably even simultaneously (to be explained below).

Fig. 2 shows an embodiment of the mobile station MS shown  
25 in Fig. 1. Here several subscriber identity modules SIM1-SIMn are provided on a single SIM-card MSIM and a receiving means H, e.g. a housing H of the mobile station MS, comprises a single SIM-card slot MSL for receiving that single SIM-card MSIM. The user inserts the single SIM-card  
30 MSIM into the single SIM-card slot to use one or more of the subscriber identity modules SIM1-SIMn provided thereon. Of course the invention is not restricted to the insertion of cards into a slot and other means for holding and inserting the MSIM into the mobile station may be used, for example a  
35 rear cover may be opened to access a card holding device in the mobile station.

Fig. 3 shows another embodiment of the mobile station MS according to the invention. Here the subscriber identity  
40 modules SIM1-SIMn are provided on separate SIM-cards SIM1-SIMn and the receiving means RC provided in the housing H

5 of the mobile station MS comprises several SIM-card slots  
SL1-SLn for receiving the separate SIM-cards SIM1-SIMn.  
Thus, the subscriber identity modules SIMs can be provided  
on one physical card each (Fig. 3) or on a single card  
(Fig. 2). Independently as to whether the configuration in  
10 Fig. 2 or Fig. 3 is used, essential for the invention is  
that the activation/deactivation means AC of the mobile  
station MS has the possibility to select or  
activate/deactivate several ones of the subscriber identity  
modules instead of only having one such module provided in  
15 the mobile station MS as shown in the prior art in Fig. 7.

When the user has inserted the multi-SIM card MSIM (Fig.  
2), or several SIM cards SIM1... SIMn (Fig. 3) the user can  
enable or disable the inserted SIMs individually. For  
20 example when the activation/deactivation means AC can  
comprise buttons, switches, commands or menus indicated on  
a display means DSP. For example, when the user has  
inserted the subscriber identity modules he/she may be  
prompted to select which ones should be activated. The user  
25 may also be provided with information regarding the  
subscriber profile data set associated with each subscriber  
identity module on a display screen DSP. Once the  
subscriber identity module has been activated, such  
activated or enabled SIMs will be considered by the mobile  
30 station for all relevant procedures necessary for the  
communication. Disabled or deactivated SIMs will not be  
considered for any function and will simply be kept in the  
receiving means (slot) for user convenience. The user can  
also be provided with a menu function which displays the  
35 activated and the deactivated cards. The user can also be  
predefine certain keys to activate specific subscriber  
identity modules.

The user can also press a default setting means DSM for  
40 setting one of said subscriber identity modules as a  
default module. There are two different possibilities of

5 default setting. One possibility is where the user  
predefines which ones of the inserted subscriber identity  
modules he/she wants to have registered as default  
subscriber identity modules in case the subscriber moves to  
a non-supporting network. The other possibility is one  
10 where the user predefines a default subscriber identity  
module to be used as default when performing an outgoing  
call.

Furthermore, the terminal (mobile station) can provide  
15 means to indicate to the user which of the activated SIMs  
are also successfully registered in the network and/or have  
been rejected by the network. This can be done by means of  
messages displayed on the display means DSP or by means of  
LEDs which change color according to the status of the  
20 respective inserted subscriber identity module. For  
example, an indicator (such as an LED) may be red when a  
specific subscriber identity module has been inserted in  
the mobile station, the LED may change the color to orange  
when the subscriber identity module has been activated in  
25 the mobile station and the LED may change the color to  
green, once the subscriber identity module has been  
successfully registered in the network (when the subscriber  
profile data set is available in the relevant visitor  
location register VLR). Furthermore there may be an  
30 indication of the default subscriber identity module which  
has been set as default for performing outgoing calls.

Once, the several subscriber identity modules SIM1... SIMn  
have been activated and registered in the network, the user  
35 can originate calls or receive calls. For calls (speech  
calls, data calls, SMS) originating from the terminal, the  
user has to select a specific subscriber identity module  
SIM for the call he wants to establish. When the user does  
not select a specific SIM according to his/her choice, the  
40 mobile station default setting means DSM will offer a  
default subscriber identity module SIM. The mobile station,

5 for example the display means, will indicate to the user  
(either permanently or upon request of the user) which  
subscriber identity module SIM is declared as the default  
SIM either by the mobile station itself or predefined as  
10 default by the user. If the user wants to originate a  
specific call (for example a private call or a business  
call) he presses a selection means SEL (Fig. 2, 3) to  
select the specific subscriber identity module according to  
his/her choice. The selection means SEL can again be a  
15 button or a switch on the mobile station MS. For example,  
the user can press the selecting means SEL repeatedly to  
brouse through several subscriber profile data sets  
displayed on the display means DSP until he/she will find a  
profile (SIM card) which provides basic services and/or  
20 supplementary services the user intends to use for the  
particular call.

As will be explained with more details below, after the  
user has activated several subscriber identity modules in  
the mobile station MS, the registration procedure in the  
25 network of such activated subscriber identity modules means  
that the visitor location register VLR currently  
responsible for handling traffic from the mobile station  
receives a copy of several subscriber profile data sets.  
Therefore, in principle even for a mobile station  
30 originating call the user can in principle also select two  
subscriber identity modules SIMs simultaneously. That is,  
the subscriber may require (for the particular call he  
intends to originate) some basic services from a first  
subscriber identity module (e.g. from a first subscriber  
35 profile data set) and some supplementary services from a  
second subscriber identity module (e.g. a second subscriber  
profile data set). Thus, during the selection process the  
user can also be prompted to select features from several  
activated subscriber identity modules to set up a call. The  
40 user can also predefine combinations of services  
(subscriber data) from several ones of his/her subscriber

5 identity modules. Such combinations can be stored and can  
be called up through a switch or button on the keyboard of  
the mobile station, such that the user does not have to  
undergo the selection procedure whenever he wants to  
initiate a particular call having particular  
10 characteristics.

The mobile station MS according to the invention also  
comprises similar means for the analogous case when a call  
is directed to the mobile station (mobile station  
15 terminating a call). That is, a call may be directed to the  
mobile station using features as defined and allowed for a  
specific subscriber profile data set (or for the  
corresponding subscriber identity module in the mobile  
station MS). For example, a case may occur where the mobile  
20 station has currently activated and registered a specific  
subscriber identity module (or its respective subscriber  
profile data set) and the call directed to the mobile  
station can actually only be received by selecting another  
(activated or non-activated) subscriber identity module. In  
25 this case, the exchange means EX can preferably provide a  
subscriber identity module addressing parameter SAP to the  
mobile station MS dependent on the characteristics of the  
mobile station terminating call. Such subscriber identity  
module addressing parameters SAPs may be negotiated with  
30 the exchange EX during the registration procedure. That is,  
a selection means SEL in the mobile station will recognize  
that a currently pending call to the mobile station uses  
specific features of a specific subscriber identity module.  
The selection means SEL can then indicate (for example on  
35 the display means DSP) for the user that a specific SIM  
needs to be selected (or activated) to accept the call. If  
the specific SIM needed has already been activated and  
registered, the selection means SEL of the mobile station  
MS can also use this subscriber identity module addressing  
40 parameter SAP to automatically (or after prompting the user  
whether he/she allows the incoming call to use features

5 from the other subscriber profile data set) switch the mobile station MS to the correct subscriber identity module. Thus, an active intervention of the user may not be needed since for each mobile station terminating call MSTC (Fig. 2) the selection means SEL automatically "tunes" to  
10 the correct SIM.

It should be noted that the designations in Fig. 1 and in other Figs. comprise descriptions using the language and the expressions as generally standardized for a GSM network  
15 according to the ETSI GSM recommendations. However, the invention is generally applicable to any telecommunication network comprising a mobile radio communication network, for example the American AMPS System, wherein the units like the HLR, MSC/VLR are represented by analogous units.

20

#### Embodiment of the network

In terms of a GSM network, Fig. 1 shows for simplicity a combined MSC/VLR node. The home location register (home  
25 data base) HLR and the visitor location register (visitor data base) VLR communicate with one another as indicated with the arrow. The MSC/VLR communicates with the terminal or mobile station MS, which is controlled by several subscriber identity modules SIM1...SIMn provided on one or  
30 several cards as explained above. Each subscriber identity module SIM is identified by a specific identifier IMSI, namely IMSI1...IMSI<sub>n</sub>, which is for example called the InternationalMobileSubscriberIdentity in a GSM-network. As is indicated with the plurality of subscriber mobile data  
35 sets SPDS1...SPDS<sub>n</sub> in the home location register HLR and in the mobile switching center/visitor location register MSC/VLR, each IMSI is allocated to a directory number MSISDN (which in the GSM network is called the MobileSubscriberISDNNumber), i.e. MSISDN1...MSISDN<sub>n</sub>. The  
40 allocation or the link between each IMSI and each MSISDN is stored in the home location register HLR and/or in the VLR

5 i which the user is registered as part of each separate subscriber profile data set SPDS1...SPDSn as is indicated in Fig. 1.

As is conventionally done for one SIM card in Fig. 7, also  
10 in Fig. 1, when an IMSI is activated by means of the SIM card SIM1... SIMn in the terminal MS, information of the IMSI is signaled to the home location register HLR, which transmits an information on the current combination IMSI1-MSISDN1... IMSIn-MSISDNn to the visitor location register  
15 VLR in order to enable the set up of calls. In the conventional case, the subscriber data (e.g. one subscriber profile data set) is copied from the home location register HLR to a respective MSC/VLR node where the mobile station MS is currently located. Thus, the (local) MSC/VLR node can  
20 use the specific subscriber data defined in this subscriber profile data set for a communication with the mobile station.

According to the invention, as explained below in more  
25 detail, the home location register stores a plurality of subscriber profile data sets SPDS1-SPDSn for each subscriber corresponding to the plurality of subscriber identity modules in the terminal MS. Since several subscriber identity modules may be activated simultaneously  
30 in the terminal MS, the MSC/VLR according to the invention has stored a plurality of subscriber profile data sets SPDS1-SPDSn corresponding to the activated subscriber identity modules for each subscriber. If by means of a registration message (in a GSM network generally the  
35 Location \_Update \_Request message) a copy of the respective subscriber profile data set has been transferred from HLR to MSC/VLR, communications between the MSC/VLR and MS can be carried out by using several subscriber profile data sets simultaneously or alternately, since also the terminal  
40 MS comprises a plurality of corresponding subscriber identity modules which can be selectively

5 activated/deactivated for singular or parallel use. The transfer of the data from HLR to MSC/VLR can be done by the mobile switching center MSC in response to the registration message. Therefore, an exchange comprising switching means with a HLR, MSC/VLR which respectively store a plurality of  
10 subscriber profile data sets enables the flexible use of several subscriber profile data sets in the PLMN. It should also be noted that, as explained before, all MSC/VLRs in the mobile radio communication network PLMN will communicate with the HLR in the same manner, e.g. whenever  
15 the mobile station MS roams or moves to a different service area (e.g. a different cell of the network PLMN), than the MSC/VLR of the next service area will respectively request the transfer of the several subscriber profile data sets SPDS1... SPDSn from the respective home location register  
20 HLR. Therefore, in all cells the usage of several subscriber profile data sets by means of several activated subscriber identity modules SIM1... SIMn in the terminal MS is enabled.

25 As explained above with reference to Fig. 1, according to the invention, a terminal MS may use several subscriber identity modules SIM1.. SIMn and the VLR/HLR respectively use several subscriber profile data sets SPDS1... SPDSn, wherein the HLR permanently stores all subscriber profiles  
30 and wherein the MSC/VLR temporarily stores the several subscriber profiles when the mobile station MS is located in the service area thereof. Essentially all the conventional attach, detach, location updating, location cancellation and subscriber data updating procedures of a  
35 conventional GSM-network can be extended to allow this functionality of the invention.

Essentially some or all of the conventional used messages need to be updated to comprise information about a  
40 plurality of subscriber identity modules SIM which have been simultaneously activated in the mobile terminal MS.

5 This will be explained for the separate procedures below.  
While the description will be made with reference to the  
standardized GSM signaling, it should be understood that  
the description is not limited thereto. Other similar  
messages in other mobile radio communication networks  
10 according to other standards can in a completely analogous  
manner be updated.

It should be noted that in the following description of  
modifications in the standard GSM signaling procedures the  
15 term "IMSI" is used solely for the mobile identity  
associated with the subscriber identity module SIM.  
However, the mobile radio communication network PLMN might  
take advantage of the concept of a temporary allocated IMSI  
(so-called TMSIs) for security reasons. In this respect the  
20 term "IMSI" is intended to also comprise the concept of  
"TMSI". Only for reasons of simplification and  
clarification the term "IMSI" is used and any other  
identifier used in a GSM-network or a corresponding  
identifier in the network according to a different network-  
25 standard can be used. It should also be noted that in some  
figures described below (for example Fig. 4) several  
messages are used simultaneously for different purposes and  
that the procedures are shown combined in one figure.

### 30 Attach procedure (registration of SIMs)

The attach procedure is a procedure that is carried out  
when a mobile station MS located in the servicing area of a  
specific visitor location register VLR is switched on for  
35 the first time, e.g. the visitor location register VLR has  
as yet no information about the (new) mobile station MS in  
its servicing area (cell). On the other hand, the home  
location register HLR will of course have permanently  
stored the subscriber profile data sets SPDS1... SPDSn for  
40 all subscriber identity module SIM1... SIMn for which the  
user has obtained a subscription from the provider of the

5 network PLMN. Of course, the situation in the attach procedure (where a VLR has no information about the new mobile station) is completely analogous to a situation where a mobile station served by a first mobile switching center/visitor location register VLR moves to a servicing  
10 area serviced by the second MSC/VLR since also in this situation the (new) second VLR has as yet no information about the (new) mobile station MS. In such situation a location update request is sent, which can be seen to be analogous to an attach request, such that in the following  
15 explanations of the attach procedure the location update request message is used.

Therefore, the situation is assumed where two or more subscriber identity modules SIM1-SIMn are inserted into a  
20 mobile station MS and each subscriber identity module has stored in a home location register of the network a corresponding profile data set SPDS1... SPDSn. It is further assumed that the user has via a selection means selected one or more of the inserted subscriber identity  
25 modules SIM1... SIMn and has activated these selected subscriber identity modules. In this situation the mobile station has as yet no indications in its data memory about a specific location area (cell). When the mobile station has been switched on, it will after locking on to a correct  
30 frequency and receiving the location area information broadcast by the network, try to get access to the network and tell the system that it is new in the specific service location area. This is essentially done by a registration message to the switching means, i.e. the mobile switching  
35 center/visitor location register MSC/VLR, of the network.

An attach procedure according to the invention is shown in Fig. 4. For the attach procedure a registration message (in GSM the so-called Location\_Update\_Request Message) is sent  
40 to the switching means MSC/VLR where the mobile station MS is currently located, wherein the registration message

27

5 includes the identifiers (IMSI) identifying the activated subscriber identity modules SIM1... SIMn in the mobile station in step S1. Since the registration message contains the identifiers of the activated subscriber identity modules, the MSC/VLR performs a signaling with one or more  
10 home location registers HLR1... HLRn in order to provide the subscriber profile data sets corresponding to the activated subscriber identity modules (as identified by the identifiers) from the respective home location register to the MSC/VLR.

15

To achieve the provision of the subscriber profile data sets to the visitor location register VLR from the respective home location register HLR, the VLR will forward the registration message in GSM (the  
20 Location\_Updating\_Request) to the respective HLR (or the respective HLRs) where the respective subscriber profile data sets according to the identifiers identifying the activated subscriber identity modules are located. As shown in Fig. 4, the registration message is forwarded from the  
25 MSC/VLR to several home location Registers HLR1... HLRn, wherein the respective registration message S21, S2n respectively contain the list of identifiers (IMSI) associated with the respective home location register. Each message can contain one (in GSM) or more identifiers.

30

Next, in steps S31, S3n the respective home location register HLR1... HLRn will return a storage request message (in GSM an Insert\_SubscriberData\_Request message) including the data of the subscriber profile data sets SPDS1... SPDSn  
35 belonging to the identifiers IMSI which characterize the activated SIMs in the mobile station MS. In response to the messages S31... S3n the MSC/VLR will store the respective subscriber profile data sets SPDS1... SPDSn belonging to the subscriber MS in the visitor location register VLR.

40

From now on the VLR can consider all IMSI (i.e. all corresponding subscriber identity modules) as being

5 attached, i.e. ready for a service in the communication network.

Finally, in step S4 the visitor location register VLR will provide the mobile station with a list of accepted IMSIs in  
10 an acknowledgment message (in GSM a Location \_ Update \_ Request message) indicating at least the list of IMSIs after a successful location updating. The list of IMSIs are basically the indication parameters for the mobile station which indicate to the mobile station the subscriber  
15 identity modules which have been successfully registered by the network.

In order to avoid that the user has to browse through several ones of the activated SIMs when a mobile station  
20 terminating call is directed to the mobile station, the acknowledgment message in step S4 preferably also provides one or a number of subscriber identity modules addressing parameters SAPs which the MSC/VLR will always send when a call using specific features of a subscriber profile data  
25 set is directed to the mobile station. Such a subscriber identity module addressing parameter SAP corresponds to (i.e. indicates) the registered profile which is needed by the incoming call. Therefore, for example SAP can indicate the IMSI in case of a GSM network. However, also other  
30 specific profile indicators can be determined by the MSC/VLR and be provided as the SAP parameters to the mobile station MS which has requested the registration.

According to another embodiment of the switching means  
35 MSC/VLR, the switching means may also itself determine from the specific features of the call whether more than one specific subscriber identity module must be used for handling the specific features of the requested mobile station terminating call. For example, the MSC/VLR can,  
40 when receiving a mobile station terminating call, compare the specific requested services used by the call with the

5 specific basic services and supplementary services to which  
the user has subscribed by means of several subscriber  
identity modules and provide several parameters SAP for  
those profiles which provide services with a best match to  
the services needed by the pending call. The MSC/VLR will  
10 then provide parameters SAP for those profiles which are  
needed to handle the call.

The attach procedure S1, S21... S2n, S31... S3n, S4 as  
described with reference to Fig. 4 is to be performed for  
15 any subscriber identity module the user activates later in  
the same manner. Whenever a SIM is activated by the user,  
the attach procedure will thus be performed indicating the  
IMSI associated with this specific new SIM and possibly  
also the already activated SIMs. During an initial attach  
20 procedure, the user may activate several subscriber  
identity modules and the first registration message can  
contain the list of the first activated subscriber identity  
modules. In a case where the registration message during an  
attach procedure only contains one identifier IMSI, the  
25 switching means (i.e. the mobile switching center of the  
network) can keep a record of all identifiers IMSIs of  
previously activated and registered subscriber identity  
modules in a memory and can generate the full list of all  
identifiers from the previously stored identifiers and the  
30 new identifier contained in the registration message.

Preferably, during each subsequent registration (attach)  
procedure, the registration message shall also indicate  
identifiers for all subscriber identity modules which have  
35 already been activated by the user previously. This means,  
that the list of IMSIs (for example shown in the message in  
step S1 in Fig. 4) always consists of all the IMSIs  
associated with activated SIMs, irrespective of whether  
they have been already included in a previous attach  
40 procedure or not. This allows the VLR to establish and  
update links (i.e. correlations) between the individual

30

5 subscriber profile data sets belonging to one individual  
user. For example, for the afore-mentioned situation where  
a mobile station terminating call may require specific  
services from several subscriber profile data sets  
belonging to the same individual user, the VLR may browse  
10 through several subscriber profile data sets all belonging  
to one user through the established links (access channels)  
such that the VLR can determine how many subscriber  
identity modules need to be activated in the mobile  
station.

15

Whilst Fig. 4 shows the general attach procedure when  
several SIMs are activated at the time of attachment and  
the subscriber profile data sets are distributed over  
several HLR1... HLRn (which may even be out of different  
20 networks), of course the simple case where only one  
provider for one network and one home location register HLR  
is provided, is also contained in Fig. 4 as special case.  
It should also be noted that the messages S51... S5n are  
not needed for the initial attach procedure since the  
25 mobile station has not been registered before in a previous  
MSC/VLR (pMSC/VLR) during the initial attach procedure. The  
messages S51... S5n are necessary when the mobile station  
roams from one cell to an adjacent cell where a handover is  
performed as will be explained below.

30

#### Location updating procedure (service area handover)

Fig. 4 also shows the case of the signaling performed when  
a mobile station MS moves from one servicing area (cell)  
35 served by a first mobile switching center/visitor location  
register MSC/VLR to another servicing area (cell) served by  
a second mobile switching center (visitor location register  
pMSC/VLR). When the switching means (the exchange) has  
detected that the mobile station moves into another service  
40 area, the first MSC/VLR sends a separate location updating  
request message respectively to one or more of the home

31

5 location register HLR1-HLRn respectively including one or a plurality of identifiers IMSIs identifying the activated subscriber identity module in the mobile station. According to the number of subscriber profile data sets currently available in the first VLR (corresponding to the number of  
10 activated subscriber identity modules in the mobile station) the first MSC/VLR can send several messages S21 each containing only one identifier IMSI or one common location update request message containing the complete list of IMSIs to one home location register HLR.

15

Like in the initial attach procedure, the messages S31... S3n will be provided to the MSC/VLR. However, since the mobile station was previously registered in the previous mobile switching center/visitor location register pMSC/VLR,  
20 the registration cancellation messages S51... S5n must be sent to the previous visitor location register such that the registration of the mobile station there is canceled. The cancellation messages may be sent individually for each IMSI or one cancellation message containing a list of IMSIs  
25 can be sent.

Thus, the location updating function of the terminal is basically performed in the same way as in the conventional techniques, only that the Location Updating Request  
30 messages sent by the terminal will contain the list of IMSIs belonging to the SIMs currently activated in the mobile station. The procedure is the same as the attach procedure, only that the VLR entries will have to be canceled with respective cancellation messages.

35

Thus, the above-described Fig. 4 shows the principle signaling when attaching or updating a location of a mobile station.

5 IMSI detach procedure (SIM deactivation)

Fig. 5 shows a procedure which is performed when the user deactivates a specific subscriber identity module in the mobile station. That is, when a selected single subscriber identity module is deactivated in the mobile station, the mobile station sends a detach message including an identifier identifying the deactivated subscriber identity module to the MSC/VLR in step S1. In this case, the message S1' in Fig. 5 only contains 1 IMSI.

For the case of a complete turn-off of the terminal, the detach message S1' contains the list of IMSIs belonging to all subscriber identity modules SIMs which have been deactivated by the activation/deactivation means AC. That is, when the terminal is switched off completely, the list of IMSIs contains all currently activated SIMs via the indicated identifiers IMSI.

Similarly, as in the attach procedure, the detach messages S21'... S2n' may be sent to the individual home location registers HLR1... HLRn separately for each IMSI. Alternatively, one common detach message S21' containing the respective list of IMSIs associated with the respective HLR may be sent to the respective home location register.

30 Paging procedure (mobile station terminating call)

Paging is a procedure which is performed in a situation when a call originated by another mobile station is pending at the MSC/VLR which is currently responsible for handling the communication to the mobile station. Such terminating traffic may relate to a speech call, Fax, data call, SMS etc. Generally, paging is the procedure in order to search a mobile station and to request user status information from the mobile station when it has been found. Paging is done before the call setup procedure which in turn includes

5 a procedure to indicate to the mobile station that a call is available and should be received by the mobile station. Paging is done according to standard procedures in the network, as for example defined by the ETSI GSM recommendations. The present invention does not require  
10 modifications in terms of how the signaling for the paging is performed. The identifier IMSI associated with the type of call or connection to be set up is used for the paging.

That is, if for example a speech call has been initiated by  
15 another subscriber (a mobile station or in fact fixed terminal), the MSC/VLR would conventionally use the IMSI1 (stored in the VLR for the respective user) and this IMSI1 is used for paging the mobile station. After such a paging procedure a call setup procedure then establishes a  
20 communication path to the mobile station such that the payload data may be transferred to the mobile station.

According to the invention a paging with a further IMSI determined as being registered within the same mobile  
25 station is not required if a communication path for the mobile station has already been setup previously for another IMSI. This can be checked by the MSC by using links (link channels) between the profiles. That is, since already one communication path may have been set up in  
30 connection with a previous paging procedure, there is no need to establish another one only for the reason that another IMSI belonging to the same subscriber shall be used.

35 To allow the MSC/VLR to detect whether a communication path has already been set up, each subscriber profile data set stored in the VLR may have associated with it an busy parameter AC/DAC (see Fig. 1) which indicates that there is already an existing connection between the respective  
40 mobile station and the respective visitor location register VLR. Thus, the busy parameter AC/DAC acts as a kind of

5 "busy" flag indicating that another paging message is not required since there is already an existing connection. Thus, a paging message to the mobile station MS is only sent when all busy parameters AC/DAC of all subscriber profile data sets linked together are in a non-busy state.

10

In order to allow the MSC/VLR to look at other subscriber profile data sets belonging to the same subscriber, common access channels CAC are provided such that subscriber profile data of the subscriber profile data sets can be used commonly. Thus, the common access channels CAC allow the MSC/VLR to determine the status of all AC/DAC flags in all subscriber profile data sets belonging to the same user.

15

20

As explained above, another purpose of the links (link channels) between the profiles is to investigate, on the basis of specific services used by a mobile station terminating call, whether or not it is necessary to use more than one subscriber profile data set in the mobile station for handling the call. In this case the MSC/VLR can search through the individual subscriber profile data sets in the VSR until all the respective services are found. The MSC/VLR will then include a corresponding number of parameters SAP in a message on the already established communication path.

25

30

#### CM service establishment (call management service)

35

The CM service establishment is a procedure used when the user requests the set up of a call or the set up of other terminal originated user procedures.

40

When the terminal (mobile station) establishes a service for the connection management sublayer, it will indicate the IMSI associated with the SIM selected for the terminal originated traffic. That is, the mobile station includes an

- 5 identifier IMSI (possibly also several identifiers) of subscriber identity modules to be used for the originating activity also in a connection management message CM.

#### Interaction of subscriber profiles

10

Above, it has already been described that the profiles associated with each activated SIM are linked in the visitor location register VLR of the network in order to provide a needed correlation. The purpose of the linking via pointers (common access channels CAC) is to be able to take advantage of data in other profiles belonging to the same subscriber. This can be used to avoid unnecessary paging (as described above) and to enable certain supplementary services to recognize that calls for separate profiles belong to the same user (e.g. for establishing a conference call between calls associated with different profiles).

Thus, for the case where several calls using different profiles for the same subscriber are pending at the MSC/VLR or for the case when a single call is pending which however requires services from several profiles, the profiles can advantageously be linked in order to ensure that only one set of channels (communication channels and signaling channels) is used on the radio interface for the individual calls or for the single more complex calls and for the signaling associated with the different profiles. On the other hand, the interaction of supplementary services in different profiles can be performed.

35

The feature that allows the common access to all profiles belonging to one subscriber is the continuous sending of identifiers IMSI belonging to activated subscriber identity modules during each attach or location update procedure.

40

5 As explained above, during the first registration, the mobile station receives the list of all IMSIs associated with subscriber identity modules SIM1... SIMn which have been activated by the user on the mobile station. The network will then perform the registration, i.e. the  
10 storage of several subscriber profile data sets in the visitor location register VLR where the mobile station is located. During any subsequent attach procedure, when the user activates a further subscriber identity module, the network again receives a list of IMSIs associated with the  
15 new subscriber identity profile as well as the already currently registered profiles (currently activated subscriber identity modules). Thus, whenever a new profile is added, the switching means receives information to establish the cross links (correlations) between the  
20 individual profiles.

On the other hand, during a detach procedure it is only necessary to deactivate cross links for the profiles belonging to deactivated subscriber identity modules.

25 The following example illustrates the purpose of using common access channels between the subscriber profile data sets stored in the visitor location register VLR. The case relates to a call waiting (CW) supplementary service then  
30 highlights the service interaction between profiles and the allocation of only one single set of channels between the switching means MSC/VLR and the mobile station:

It is assumed that the user has subscribed to the CW  
35 service on one of his active profiles, i.e. when the user is busy with a call associated with this profile (referred to as profile SPDS1) and receives another call on the same profile, then the user is informed about the incoming call due to CW, allowing him to release the on-going call and  
40 accept the incoming call instead.

5 When the second call comes in on another profile (referred to as profile SPDS2), then the MSC/VLR needs to check whether the subscriber is already busy on another active profile in order to prevent unnecessary paging of the terminal, as a connection already exists for the on-going  
10 call associated with profile SPDS1. Otherwise the MSC/VLR would treat this as a call to another user on another terminal, i.e. the terminal would be paged on a set of required channels would be assigned for signaling and communication purposes. Hence, profile SPDS1 needs a link  
15 (a link channel) to profile SPDS2 (and any other active profile).

For the incoming call, the VLR will examine each of the other active profiles via the link, whether the subscriber  
20 is busy or not by checking the "busy" flag for each profile. If he is busy, the call is only signaled to the terminal, if the subscriber has subscribed to CW on the profile(s) for which he is busy. If CW is not subscribed, the incoming call is released with a busy indication  
25 provided to the caller. If call waiting is subscribed, then the call is offered to user. If the user accepts the waiting call by releasing the on-going call (or by another procedure offered by other subscribed supplementary services like call hold), the same communication channel is  
30 used for the accepted waiting call as for the previous active, but now released call (or in the case of applied call hold, held call).

Other supplementary services operating on parallel calls  
35 make use of the links between profiles in order to check whether the profile associated with the call to which the service shall be applied includes a subscription to the service. These supplementary services are Call Hold service (which allows to alternate between two calls, i.e. one is  
40 on hold, the other is in active communication phase) Multi Party Call (conference call between three or more parties),

5 and the Call Transfer service (which allows a user to connect a call in active communication and a held or alerting call and refraining himself from the communication).

10 Update of profiles in the VLR

There are two situations where an updating of profiles in a VLR may be performed. The first case is when certain subscriber data in the profile has changed (due to a change  
15 subscription arrangement between the provider and user). The second case is when the terminal has moved to another MSC/VLR service area (cell), i.e. the location updating as was already explained with reference to Fig. 4. In the latter case the profile (set of subscriber data) has to be  
20 transferred to another VLR.

For the case where only one specific subscriber profile data set has changed, the MSC/VLR sends a separate Location\_Update\_Request message for each subscriber profile  
25 data set to a corresponding home location register HLR where such new subscriber data is stored. The information contained in the request message indicates the IMSIs identifying the subscriber profile data records to which the transfer data record relates.

30

Alternatively, for a more efficient updating procedure, the MSC/VLR can send one combined Location\_Update\_Request message for all records belonging to the same service provider, i.e. the list of IMSIs sent along with the  
35 request as received from the terminal with one IMSI pointing out the same service provider. The HLR will then send the data for all records as part of the location update procedure and cancel the old location by only one Location\_Cancellation\_Request message.

40

- 5 Fig. 6 shows such a combined updating of subscriber profiles in the VLR. The messages S21... S2n in Fig. 6 correspond to the messages shown in Fig. 4.

#### Operation in non-supporting networks

10

When the mobile station roams to another network which does not allow a registration and activation/deactivation of several subscriber profiles, the mobile station receives a location updating reject message from a switching means of the new network indicating that the location updating can only be performed for one specific subscriber identity module, whereupon the mobile station either selects a default subscriber identity module or prompts the user to select one. At this stage, the user may change the SIM at any time by performing the activation/deactivation procedures provided by the mobile station.

20

The second option is to let a non-supporting network ignore the list of IMSIs a location updating request except for one IMSI. The accepted IMSI will then correspond to a default IMSI or default subscriber identity module. The network will indicate the successful location updating for only the accepted IMSI. In turn, the terminal can inform the user of the non-support in the network and which SIM is accepted as active. The user can then disable the default SIM and enable another SIM if required.

30

That is, when the new network returns a response message indicating that it does not support several subscriber identity modules then the mobile station may react to this by sending a standard location updating message with only one identity which is the default identity to be used in non-supporting networks. Alternatively the mobile station can indicate the default identity to be used in non-supporting networks as the one which is recognized by the network and no further action is needed.

40

5

Industrial applicability

As explained above, in a telecommunication system comprising a switching means and one or more mobile stations as described above, the subscriber can use several subscriber profile data sets simultaneously. Each profile can relate to a separate account, i.e. can be charged separately. Each profile may preferably consists of a different set of basic and supplementary services according to the needs associated with each of the profiles. Therefore, the subscriber is in full control of which profile is used by inserting the relevant subscriber identity modules SIMs into the mobile station and by activating or deactivating these inserted SIMs.

20

Furthermore, since each inserted SIM having an associated IMSI may belong to different users, there is the potential possibility that the mobile station having inserted several such SIMs of different users can be shared by several users.

25

The subscriber can also select which SIM shall be in use in case of roaming to a network which does not support the service (i.e. the network only supports the common one-to-one relation between subscriber, terminal and SIM). The subscriber may thus choose to subscribe to profiles of different service providers (also of different networks) simultaneously as each subscriber identity modules SIM is associated with the service provider.

35

Thus, the invention goes beyond the conventional use of a multiple subscriber profile MSP service since the subscriber has an active control over several subscriber identity modules simultaneously. In fact to invention is actually to replace the conventional MSP service The invention is not restricted to a GSM network and

40

- 5 corresponding signaling messages in other networks can easily be updated according to the teaching of the present invention.

Therefore, the invention is not limited by the above--  
10 described embodiments and the teachings described above. In particular, the invention can comprise features that result from various combinations of features as disclosed in the attached claims.

- 15 Reference numerals in these claims only serve clarification purposes and do not limit the scope of the invention.

5

Claims

1. A mobile station (MS1-MS4) for performing communications in a telecommunication system (TELE) including at least one mobile radio communication network (PLMN) using several subscriber profiles, comprising:
- 10
- a) receiving means (H) for receiving two or more subscriber identity modules (SIM1-SIMn) each having stored in a home location register (HLR) of said at least one network (PLMN) a corresponding subscriber profile data set (SPDS1...SPDSn, MSP) simultaneously in the mobile station (MS); and
- 15
- 20
- b) activation/deactivation means (AC) for selectively activating/deactivating one or more of said subscriber identity modules (SIM1-SIMn) for a communication in said network (PLMN).
- 25
2. A mobile station (MS1-MS4) according to claim 1, characterized in that said subscriber identity modules (SIM1-SIMn) are provided on a single SIM card (MSIM) and said receiving means (H) comprises a single SIM card holding device (MSL) for receiving said single SIM card (MSIM).
- 30
- 35
3. A mobile station (MS1-MS4) according to claim 1, characterized in that said subscriber identity modules (SIM1-SIMn) are provided on separate SIM cards (SIM1-SIMn) and said receiving means (RC) comprises several SIM card holding devices (SL1-SLn) for receiving said separate SIM cards (SIM1-SIMn).
- 40

5

4. A mobile station (MS1-MS4) according to claim 1,  
*characterized by*  
a display means (DSP) for indicating to the user which  
of the received subscriber identity modules (SIM1-  
SIMn) are active and/or which of the activated  
subscriber identity modules (SIM1-SIMn) have been  
successfully registered in the network (PLMN) and/or  
the available basic services and the supplementary  
services per subscriber identity module (SIM1-SIMn)  
and/or a default subscriber identity module (SIMn).

10

15

5. A mobile station (MS1-MS4) according to claim 1,  
*characterized by*  
a selection means (SEL) selecting a specific  
subscriber identity module (SIM1-SIMn) in accordance  
with the characteristics of a desired mobile station  
originating call.

20

6. A mobile station (MS1-MS4) according to claim 1,  
*characterized by*  
a default setting means (DSM) for setting one of said  
subscriber identity modules (SIM1-SIMn) as a default  
module to be registered and/or the be used for  
outgoing calls.

25

30

7. A mobile station (MS) according to claim 1,  
*characterized in that*  
said mobile station (MS) comprises a selection means  
(SEL) for selecting one of said subscriber identity  
modules (SIM1-SIMn) and for switching to the selected  
subscriber identity module (SIM1-SIMn) for performing  
communications dependent on a subscriber identity  
module addressing parameter (SAP) indicating that a  
call corresponding to an identifier (IMSI) determined  
as being registered in said mobile station (MS) uses a  
specific subscriber profile data set (SPDS1-SPDSn)

35

40

5 corresponding to a specific subscriber identity module (SIM1-SIMn) in said mobile station (MS).

8. A mobile station (MS1-MS4) according to claim 1,  
characterized in that  
10 said activation/deactivation means (AC) sends a registration message (Location\_Updating\_Request(list of IMSIs)) to a switching means (MSC/VLR) of said network (PLMN) including a list of identifiers (IMSIs) identifying the activated subscriber identity modules  
15 (SIM1-SIMn) in said mobile station (MS) to request the storage of subscriber profile data sets (SPDS1...SPDSn, MSP) corresponding to the activated subscriber identity modules (SIM1-SIMn) from at least one home location register (HLR) in said switching  
20 means (MSC/VLR).

9. A mobile station (MS1-MS4) according to claim 8,  
characterized in that  
said at least one mobile radio communication network  
25 (PLMN) is a network (PLMN) according to the GSM-standard, wherein said activation/deactivation means (AC) sends a Location\_Update\_Request message containing a list of IMSIs (InternationalMobileSubscriberIdentity) identifying  
30 said activated subscriber identity modules (SIM1-SIMn) to a mobile switching centre/visitor location register (MSC/VLR) of said network (PLMN).

10. A mobile station (MS1-MS4) according to claim 9,  
35 characterized in that said IMSIs used for identifying the mobile station identity associated with the subscriber identity module (SIM1-SIMn) are temporary allocated IMSIs (TMSIs).

40

45

- 5    11. A method for performing communications between mobile  
stations (MS1-MS4) in a telecommunication system  
(TELE) comprising at least one mobile radio  
communication network (PLMN) using several subscriber  
profiles, comprising the following steps:
- 10            a) inserting two or more subscriber identity modules  
(SIM1-SIMn) into a mobile station (MS1-MS4) each  
subscriber identity module (SIM1-SIMn) having  
stored in a home location register (HLR1-HLRn) of  
15    said at least one network (PLMN) a corresponding  
subscriber profile data set (SPDS1...SPDSn, MSP);  
and
- b) selecting one or more of the inserted subscriber  
20    identity modules (SIM1-SIMn) and  
activating/deactivating selected subscriber  
identity modules (SIM1-SIMn).
12. A method ("attach") according to claim 11,  
25    characterized by the following step:
- c) sending a registration message  
(Location\_Updating\_Request(list of IMSIs)) to a  
switching means (MSC/VLR) of said network (PLMN)  
30    where said mobile station (MS) is located  
including at least one identifier (IMSIs)  
identifying at least one activated subscriber  
identity module (SIM1-SIMn); and
- 35            d) providing the subscriber profile data sets  
(SPDS1...SPDSn, MSP) corresponding to the  
activated subscriber identity modules (SIM1-SIMn)  
from at least one home location register (HLR) to  
the switching means (MSC/VLR).

40

5 13. A method according to claim 12,  
*characterized by the following step:*

10 e) sending to the mobile station (MS) indication  
parameters (IMSIs) indicating to the mobile  
station (MS) the subscriber identity modules  
(SIM1-SIMn) which have been registered by said  
network (PLMN).

14. A method according to claim 13,  
15 *characterized in that*  
when a call is directed to said mobile station (MS) a  
subscriber identity module addressing parameter (SAP)  
indicating that a call using a specific subscriber  
profile data set (SPDS1-SPDSn) corresponding to a  
20 specific subscriber identity module (SIM1-SIMn) is  
pending at said mobile station (MS1-MS4) is send to  
said mobile station, whereupon said mobile station  
(MS) switches to the particular subscriber identity  
module (SIM1-SIMn) for performing communications.

25 15. A method according to claim 12,  
*characterized in that*  
said steps c) and d) are carried out whenever a new  
subscriber identity module (SIM1-SIMn) is activated.

30 16. A method according to claim 12,  
*characterized in that*  
said at least one mobile radio communication network  
(PLMN) is a network (PLMN) according to the GSM-  
35 standard, wherein in said step c) said mobile station  
(MS) sends a Location\_Update\_Request message  
containing a list of IMSIs  
(InternationalMobileSubscriberIdentity) identifying  
said activated subscriber identity modules (SIM1-SIMn)  
40 to a mobile switching centre/visitor location register  
(MSC/VLR) of said network (PLMN); and

5

in said step d) the mobile switching centre/visitor location register (MSC/VLR) forwards the Location\_Update\_Request message including the list of IMSIs (InternationalMobileSubscriberIdentity) to one or more home location registers (HLR1-HLRn) of said at least one network (PLMN), said one or more home location registers (HLR1-HLRn) returning an Insert\_SubscriberData\_Request message containing a list of subscriber profile data sets corresponding to said IMSIs (InternationalMobileSubscriberIdentity) and said subscriber profile data sets being stored in the visitor location register (VLR) of said switching means (MSC/VLR).

10

15

20

17. A method according to claim 13, characterized in that said at least one mobile radio communication network (PLMN) is a network (PLMN) according to the GSM-standard, wherein in said step e) as said indication parameters (IMSIs) a list of accepted IMSIs (InternationalMobileSubscriberIdentity) is sent to the mobile station (MS) in a Location\_Updating\_Accept message.

25

30

18. A method according to claim 16 or 17, characterized in that said IMSIs used for identifying the mobile station identity associated with the subscriber identity module (SIM1-SIMn) are temporary allocated IMSIs (TMSIs).

35

19. A method ("detach") according to claim 11, characterized in that when a selected single subscriber identity module (SIM1-SIMn) is deactivated, said mobile station (MS) sends a detach message (IMSI\_Detach\_Req) including an

40

5 identifier (IMSI) identifying the deactivated  
subscriber identity module (SIM1-SIMn) to a switching  
means (MSC/VLR).

20. A method ("detach") according to claim 11,  
10 *characterized in that*  
when a plurality of subscriber identity modules (SIM1-  
SIMn) are deactivated, said mobile station (MS) sends  
a detach message (IMSI\_Detach\_Req(List of IMSIs))  
respectively including an identifier (IMSI)  
15 identifying a deactivated subscriber identity module  
(SIM1-SIMn) to a switching means (MSC/VLR) of the at  
least one network (PLMN), wherein said switching means  
(MSC/VLR) forwards to the respective home location  
register (HLR1-HLRn) of said at least one network  
20 (PLMN) a corresponding detach message (IMSI\_Detach\_Req  
(List of IMSIs associated with HLR1-HLRn)) including  
the identifier (IMSI) of the respectively deactivated  
subscriber profile identity module (SIM1-SIMn) for  
which a respective subscriber profile data set (SPDS1-  
25 SPDSn) is stored in said home location register (HLR1-  
HLRn).

21. A method according to claim 11,  
*characterized in that*  
30 each of said subscriber profile data sets (SPDS1-  
SPDSn) stored in said home location register (HLR1-  
HLRn) comprise one or more of the following data: an  
identifier (IMSI) indicating that a subscriber profile  
data set (SPDS1-SPDSn) belongs to a specific  
35 subscriber (user), a directory number parameter  
(MSISDN), basic service data, supplementary service  
data, location data and an busy-parameter (AC/DAC)  
indicating whether a specific subscriber identity  
module (SIM1-SIMn) is activated in said mobile station  
40 (MS).

- 5 22. A method ("paging") according to claim 21,  
characterized in that  
when a call is to be routed to said mobile station  
(MS), a switching means (MSC/VLR) determines the user  
to which the call is to be routed on the basis of the  
10 identifier (IMSI) indicated in said call, determines  
the status of the busy-parameter (AC/DAC) in all  
subscriber profile data sets (SPDS1-SPDSn) associated  
with this user and sends a paging message to said  
mobile station (MS) only when all busy-parameters  
15 (AC/DAC) have a non-busy status.
23. A method ("CM service") according to claim 11,  
characterized in that  
said mobile station (MS) includes one identifier  
20 (IMSI) of the activated subscriber identity modules  
(SIM1-SIMn) in a connection management message (CM).
24. A method ("modified attach") according to claim 15,  
characterized in that  
25 in addition to the identifier (IMSI) of the newly  
activated subscriber identity module (SIM1-SIMn), said  
list also contains the identifier (IMSI) of subscriber  
identity modules (SIM1-SIMn) which have previously  
been activated and registered in said at least one  
30 network (PLMN).
25. A method ("network requirements - profiles") according  
to claim 12, 15, 20 or 23, characterized in that  
the subscriber profile data sets (SPDS1-SPDSn) stored  
35 in the visitor location register (MSC/VLR) for  
activated subscriber identity modules (SIM1-SIMn) of  
the same subscriber (user) are linked through common  
access channels, wherein subscriber profile data of  
one subscriber profile data set (SPDS1-SPDSn) can be  
40 used commonly.

- 5 26. A method ("separate and common updating of profiles")  
according to claim 11, *characterized in that*  
when said mobile station (MS) moves from one servicing  
area served by a first mobile switching center/visitor  
location register (pMSC/VLR) to another servicing area  
10 served by a second mobile switching center/visitor  
location register (pMSC/VLR), the second mobile  
switching center/visitor location register (MSC/VLR)  
sends a separate location updating request message  
(Location\_Update\_Req) respectively to one or more home  
15 location registers (HLR1-HLRn) including one  
identifier (IMSI) identifying one or all activated  
subscriber identity modules (SIM1-SIMn) in said mobile  
station (MS), wherein said respective home location  
register (HLR1-HLRn) copies the respective subscriber  
20 profile data set (SPDS1-SPDSn) into the second visitor  
location register (MSC/VLR).
27. A method ("terminating traffic") according to claim  
14, *characterized in that*  
25 said subscriber identity module selection parameter  
(SAP) indicates a subscriber identity module in said  
mobile station for which a subscriber profile data set  
is currently registered.
- 30 28. A method ("non-supporting networks") according to one  
of claims 25-27, *characterized in that*  
when said mobile station (MS) roams to another network  
(PLMN) which does not allow a registration and  
activation/deactivation of several subscriber  
35 profiles, the mobile station (MS) receives a location  
updating response message from a switching means  
(MSC/VLR) of the another network (PLMN) indicating  
that the location updating can only be performed for  
one subscriber identity module (SIM1-SIMn), whereupon  
40 said mobile station (MS) either selects a default

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5 subscriber identity module (SIM1-SIMn) or prompts the user to select one.

29. A method ("non-supporting networks") according to one of claims 25-27, *characterized in that*  
10 when said mobile station (MS) roams to another network (PLMN) which does not allow a concurrent registration of several subscriber identity modules simultaneously, the switching means (MSC/VLR) of the another network (PLMN) performs a location updating procedure for a  
15 default subscriber identity module (SIM1-SIMn) of a default subscriber profile data set (SPDS1-SPDSn), wherein the default subscriber identity module is defined by said another network or a default subscriber identity module selected as default by the  
20 the user.

30. A mobile radio communication network ((HLR, MSC/VLR, EX; PLMN) for performing communications between mobile stations (MS1-MS4) using several subscriber profiles,  
25 comprising:

a) at least one home location register (HLR) storing a plurality of subscriber profile data sets (SPDS1-SPDSn) for each subscriber of the mobile  
30 radio communication network (PLMN);

b) a mobile switching center (MSC) for transferring in response to a registration message (Location\_Updating\_Request(list of IMSIs))  
35 received from a mobile station (MS) and including identifiers (IMSI) identifying a plurality of activated subscriber identity modules (SIM1-SIMn) from said at least one home location register (HLR) to a visitor location register (VLR) a copy  
40 of a plurality of subscriber profile data sets (SPFD1-SPDSn) corresponding to said activated

5 subscriber identity modules (SIM1-SIMn) for each subscriber; and

c) a visitor location register (VLR) for storing  
said plurality of subscriber profile data sets  
10 (SPFD1-SPDSn) simultaneously for each subscriber.

31. A network (HLR, MSC/VLR, EX) according to claim 30,  
*characterized in that*

15 when a call from a mobile station (MS) is pending at  
said mobile switching center (MSC), said mobile  
switching center (MSC) transfers to a called mobile  
station (MS) SEL) a subscriber identity module  
addressing parameter (SAP) indicating that the call  
directed to said mobile station (MS) uses a specific  
20 subscriber profile data set (SPDS1-SPDSn)  
corresponding to a specific activated subscriber  
identity module (SIM1-SIMn) in said mobile station  
(MS).

25 32. A network (HLR, MSC/VLR, EX) according to claim 30,  
*characterized in that*  
said mobile switching center (MSC) sends to the mobile  
station (MS) indication parameters (IMSI) indicating  
to the mobile station (MS) the subscriber identity  
30 modules (SIM1-SIMn) which have been registered in said  
visitor location register (VLR) by said network  
(PLMN).

33. A network (HLR, MSC/VLR, EX) according to claim 30,  
35 *characterized in that*  
each of said subscriber profile data sets (SPDS1-  
SPDSn) stored in said at least one home location  
register (HLR1-HLRn) comprise one or more of the  
following data: an identifier (IMSI) indicating a  
40 specific subscriber profile data set (SPDS1-SPDSn), a  
directory number parameter (MSISDN), basic service

5 data, supplementary service data, location data and an busy-parameter (AC/DAC) indicating whether a specific subscriber identity module (SIM1-SIMn) is activated in said mobile station (MS).

10 34. A network (HLR, MSC/VLR, EX) according to claim 33, characterized in that  
when a call is to be routed to said mobile station (MS), said mobile switching center (MSC) determines the user to which the call is to be routed on the basis  
15 of the directory number (MSISDN) indicated in said call, determines the status of the busy-parameter (AC/DAC) in all subscriber profile data sets (SPDS1-SPDSn) associated with this user and sends a paging message to said mobile station (MS) only when all  
20 busy-parameters (AC/DAC) have a non-busy status.

35. A network (HLR, MSC/VLR, EX) according to claim 30, characterized in that  
the subscriber profile data sets (SPDS1-SPDSn) stored  
25 in the visitor location register (MSC/VLR) for activated subscriber identity modules (SIM1-SIMn) of the same subscriber (user) are linked through link channels (CAC), wherein subscriber profile data of one subscriber profile data set (SPDS1-SPDSn) can be used  
30 commonly.

36. A network (HLR, MSC/VLR, EX) according to claim 33, characterized in that  
said subscriber identity module selection parameter  
35 (SAP) is one of the group consisting of: a called party number (MSISDN) or a subscriber profile data set indication parameter (SAP).

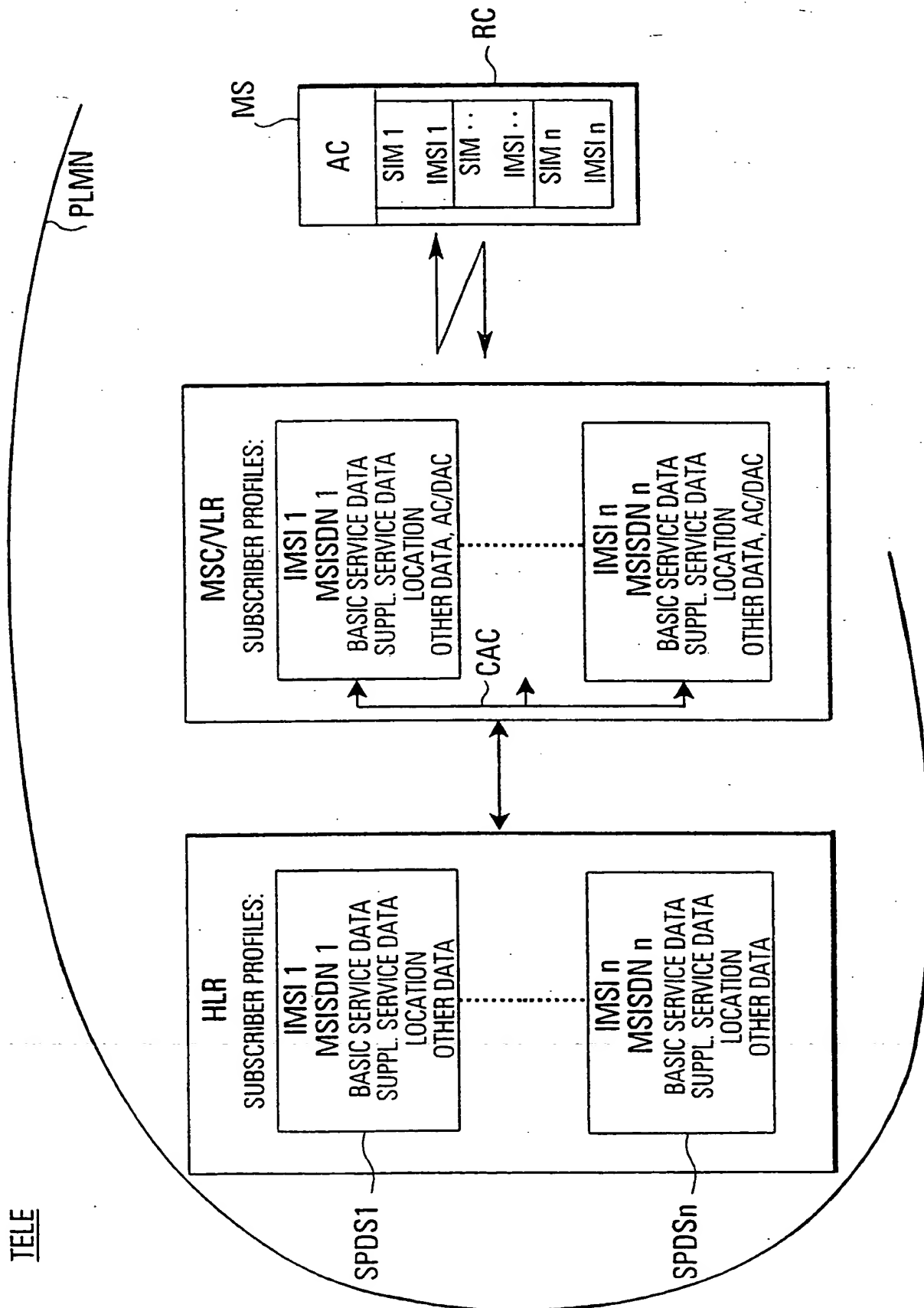
37. A telecommunication system (TELE) comprising at least  
40 one network (HLR, MSC/VLR) according to claims 30-36

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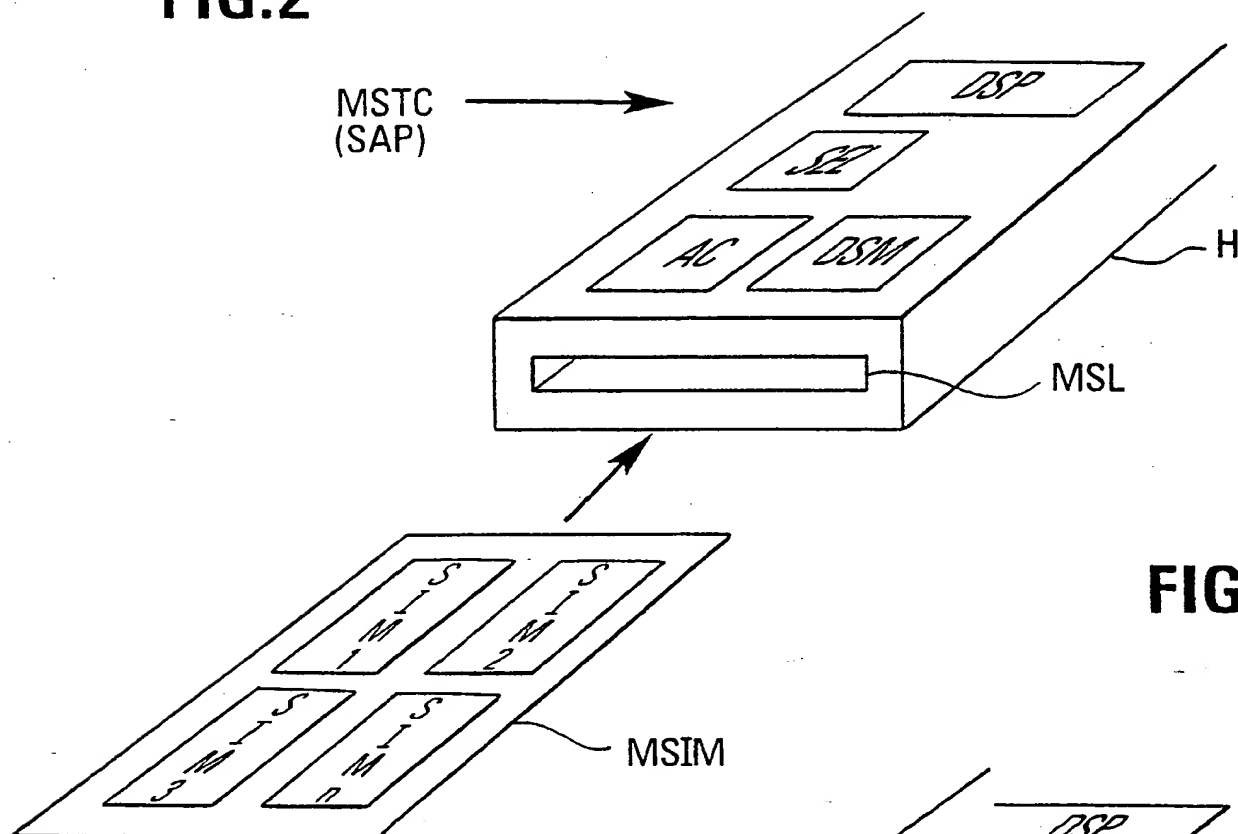
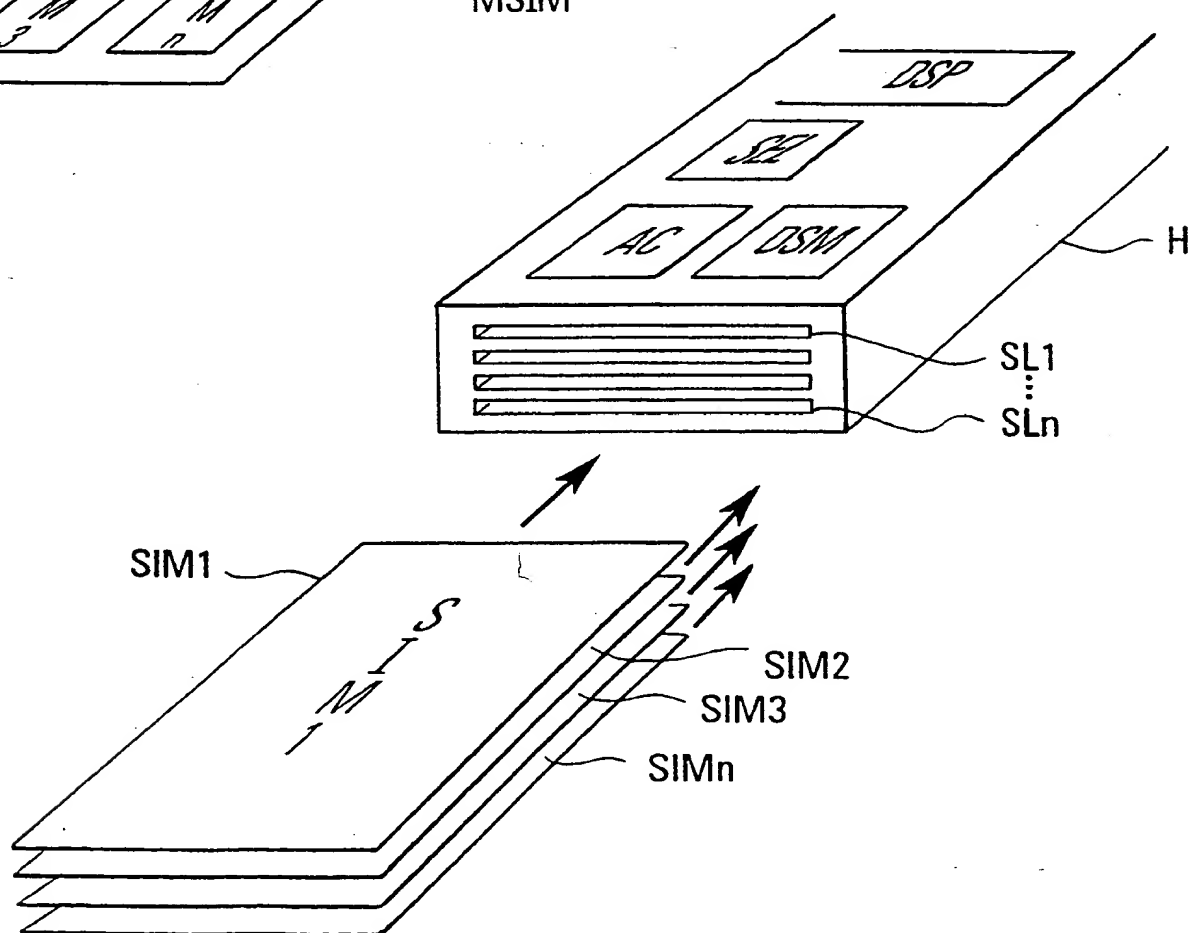
5 and at least one mobile station (MS1-MS4) according to claims 1-10.

1/6

FIG.1



2/6

**FIG.2****FIG.3**

## FIG. 4

SIMULTANEOUS LOCATION UPDATING OR ATTACH FOR SEVERAL IMSIs

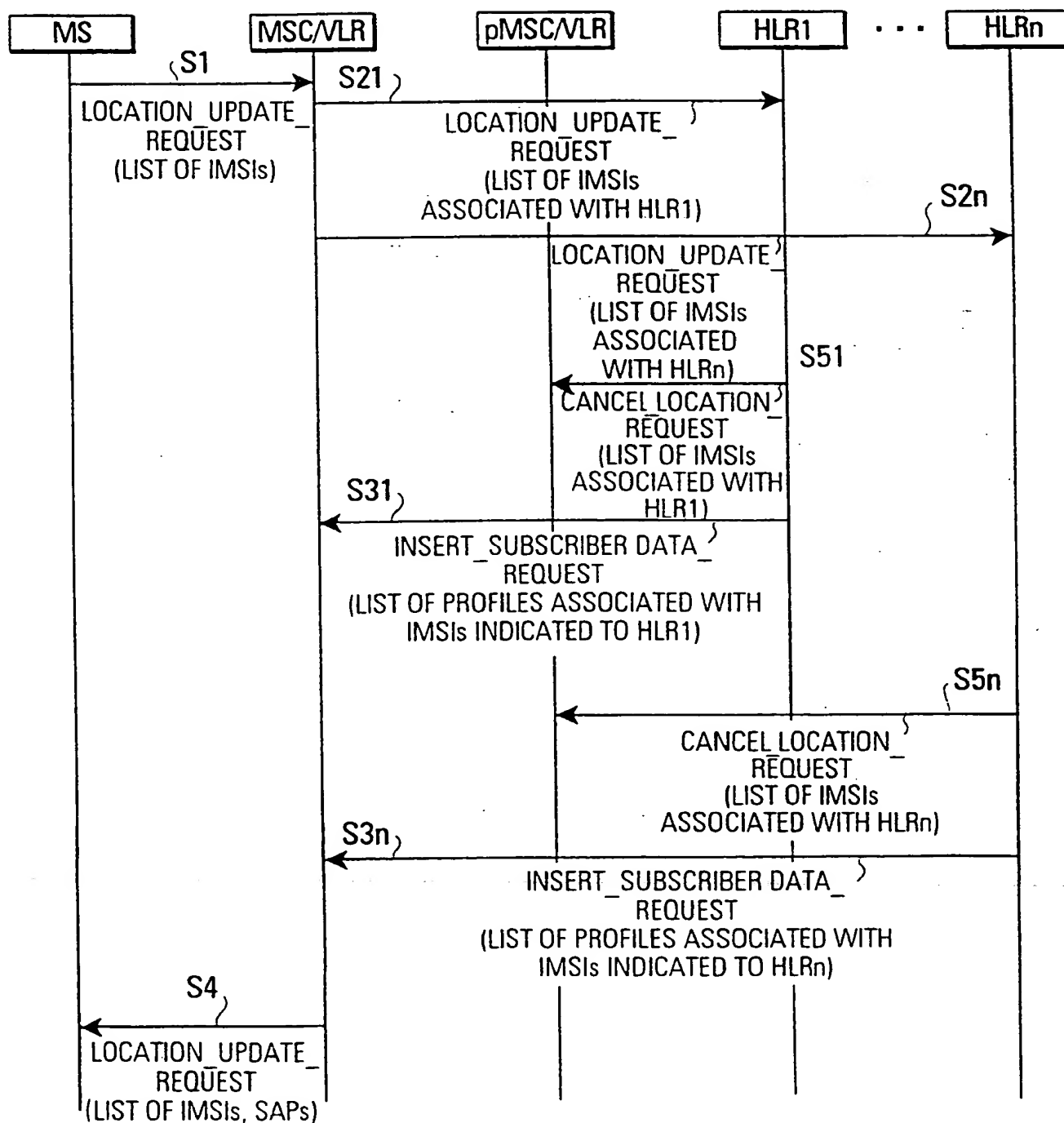
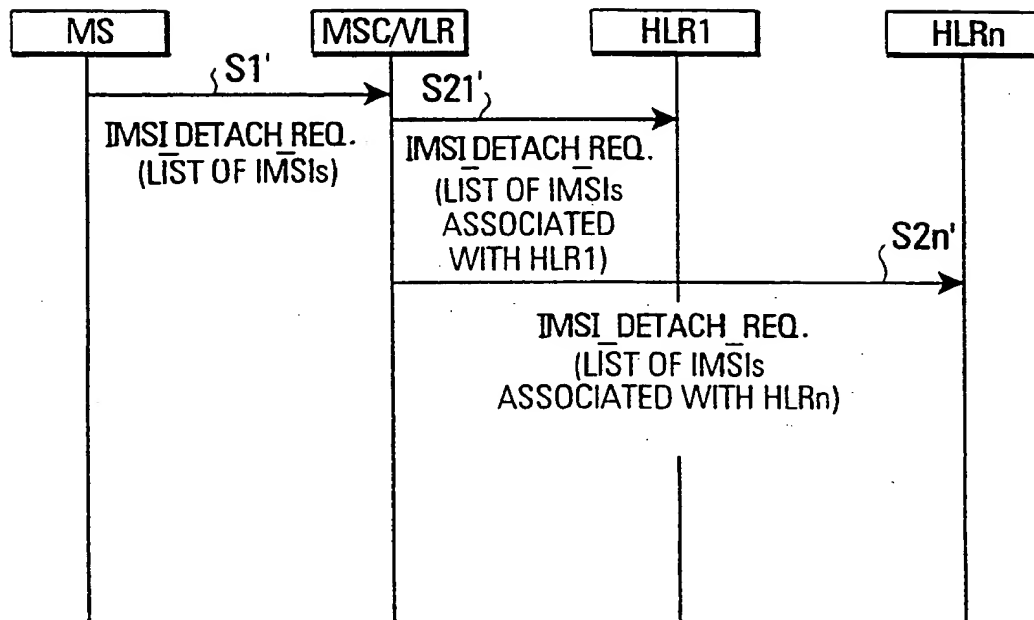


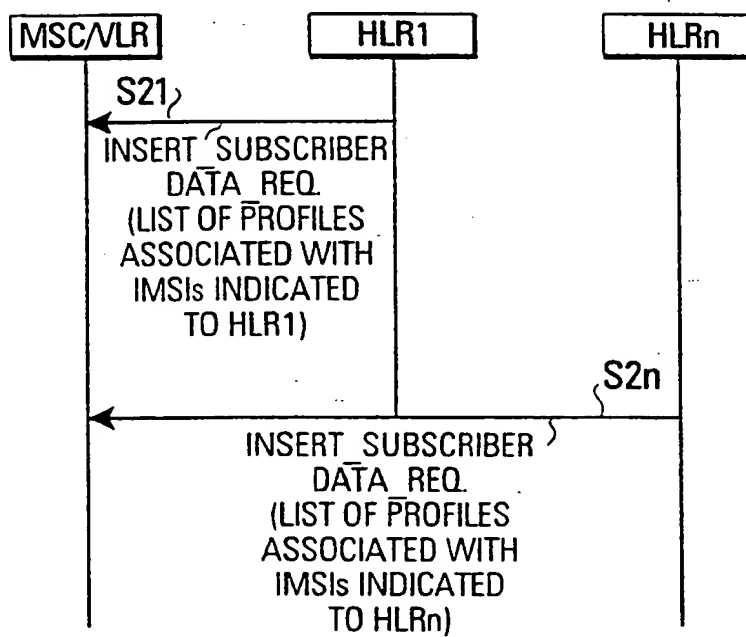
FIG.5

SIMULTANEOUS DETACH FOR SEVERAL IMSIs

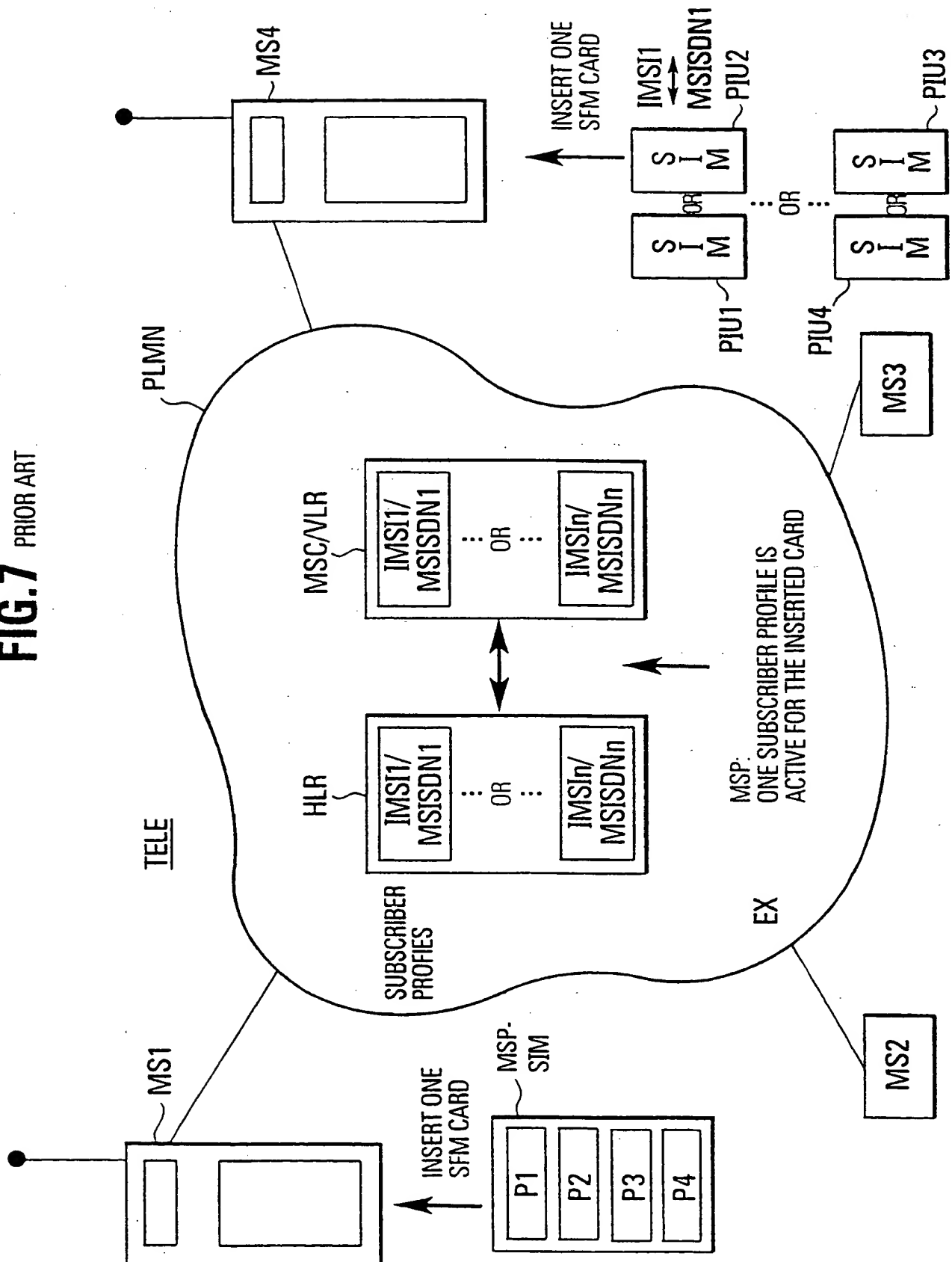


**FIG.6**

## UPDATING OF PROFILE FOR SEVERAL IMSIs



**FIG.7** PRIOR ART



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/03556

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 H0407/38 H0407/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H040

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92 19078 A (COMVIK GSM AB) 29 October 1992 (1992-10-29)	1,2,11, 12,15, 19,23
Y	page 7, line 24 -page 8, line 4	4-7,21
A		8,9
Y	EP 0 526 981 A (NOKIA MOBILE PHONES LTD) 10 February 1993 (1993-02-10) column 2, line 51 -column 4, line 38	4-7
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

30 September 1999

Date of mailing of the international search report

08/10/1999

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/03556

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